

What is claimed is:

1. An efficient method for fabricating an article using photo-activatable building material, comprising the steps of:

5 applying a layer of the photo-activatable building material to a preselected surface;

10 scanning the layer using a plurality of light-emitting centers to photo-activate the layer of photo-activatable building material in accordance with a predetermined photo-initiation process to obtain polymerization of the building material, wherein scanning is accomplished at a predetermined distance using a predetermined light intensity; and

15 repeating the steps of applying the layer, with each layer being applied to an immediately previous layer, and scanning the layer with the plurality of light-emitting centers to polymerize the building material until the article is fabricated.

2. The method of claim 1 wherein the light-emitting centers are one of: light-emitting diodes and laser diodes.

20 3. The method of claim 2 wherein scanning is accomplished using a modified printing cartridge that includes, located at an orifice plate, at least one of: light focusing devices and light baffling devices.

4. The method of claim 3 wherein the light focusing devices include lenses at nozzle locations and wherein the lenses are set at predetermined distances from the light-emitting centers.

5. The method of claim 1 wherein applying a layer of the photo-activatable building material is accomplished by one of: silk-screening, spraying, spinning the building material in a manner that deposits a thin layer of the building material onto the preselected surface in a desired conformation and a process of lowering a platform a predetermined distance into a bath of liquid photo-activatable building material prior to each photo-activation to obtain a plurality of photo-activated layers of building material.

6. The method of claim 1, further including a step of, after the article is fabricated, curing the article in accordance with a predetermined scheme.

7. The method of claim 6 further including a step of, after curing, rinsing non-polymerized material off the article.

8. An article fabricated using photo-activatable building material, comprising: a plurality of thin layers, prepared by applying a thin layer of photo-activatable building material, wherein each thin layer is photo-activated prior to applying a next layer thereto to polymerize the photo-activatable building material and attach each successive layer to a previous layer.

9. The article of claim 8 wherein photo-activating is accomplished using light-emitting centers that are one of: light-emitting diodes and laser diodes.

10. The article of claim 9 wherein the light-emitting centers are disposed in a modified printing cartridge that includes, located at an orifice plate, at least one of: light focusing devices and light baffling devices.

11. The article of claim 10 wherein the light focusing devices include lenses at nozzle locations, wherein the lenses are set at predetermined distances from the light-emitting centers.

12. The article of claim 8 wherein applying a thin layer of photo-activatable building material includes one of: silk-screening, spraying, spinning, and lowering a platform a predetermined distance into a bath of liquid photo-activatable building material prior to each photo-activation.

5 13. The article of claim 8 wherein, the article comprising the plurality of thin layers, after completion of application and photo-activation of the thin layers, is cured for a predetermined time.

14. A system for fabricating an article using photo-activatable building material, comprising:

10 a fabrication printer comprising:

a controller, coupled to an applicator, and a transport, for activating the applicator to apply a thin layer of photo-activatable building material in a predetermined shape, and activating a plurality of light-emitting centers for photo-activating the thin layer of building material when the thin layer has been applied,
15 and continuing activating the applicator and the plurality of light-emitting centers successively in accordance with a preselected fabrication scheme until the article is fabricated,

the applicator, coupled to the controller, for, in response to signals from the controller, applying the thin layer of the photo-activatable building
20 material in the predetermined shape to a preselected surface,

the plurality of light-emitting centers, coupled to be activated by the controller, for, when signaled to activate the thin layer by the controller, passing over the thin layer and photo-activating the thin layer of photo-activatable building

material in accordance with a predetermined photo-initiation process to obtain polymerization of the building material;

wherein the applicator applies each successive layer to an immediately previous layer, and the plurality of light-emitting centers photo-

5 activate each successive layer applied until the article is fabricated; and

a transport, coupled to the controller, for moving the preselected surface proximate to the applicator and the plurality of light-emitting centers in accordance with a predetermined scheme.

15 15. The system of claim 14 wherein the light-emitting centers include one of: light-emitting diodes and laser diodes.

16. The system of claim 15 wherein the light-emitting centers are disposed in a modified printing cartridge that includes, located at an orifice plate, at least one of: light focusing devices and light baffling devices.

15 17. The system of claim 16 wherein the light focusing devices include lenses at nozzle locations, wherein the lenses are set at predetermined distances from the light-emitting centers.

20 18. The system of claim 14 wherein the photo-activatable building material is applied using one of: silk-screening, spraying, spinning, and lowering a platform a predetermined distance into a bath of liquid photo-activatable building material prior to each photo-activation.

19. The system of claim 14 wherein the applicator applies the layer of the photo-activatable building material to the preselected surface by one of: silk-screening, spraying, spinning the building material in a manner that deposits a thin layer of the building material onto the preselected surface in a desired

conformation and a process of lowering a platform a predetermined distance into a bath of liquid photo-activatable building material prior to each photo-activation to obtain a plurality of photo-activated layers of building material.

20. The system of claim 14, further including a curing oven, arranged to
5 receive the article from the fabrication printer when the article is completed, for, upon direction by the controller, curing the article in accordance with a predetermined scheme;

21. The system of claim 14 wherein the controller is further coupled to a
10 rinsing unit and the rinsing unit is arranged to receive the article via the transport from the curing oven after curing and cooling, for rinsing non-polymerized material off the article.

22. An efficient method for fabricating an article using photo-activatable building material wherein light-emitting diode polymerization is utilized, comprising the steps of:

15 laying down a layer of photo-activated polymer with a thickness suitable for photo-activation by a blue light-emitting diode;

polymerizing a cross section of the design by "printing" with at least one blue light-emitting diode; and

20 repeating laying down layers and polymerizing until an entire cross-section of the desired article has been photo-activated.

23. The method of claim 22, further including a step of curing the article and, where desired, removing uncured photo-activated polymer by rinsing.

24. A system for fabricating an article using photo-activatable building material, comprising:

a fabrication printer comprising:

a controller, coupled to a light-emitting array power and timing counter, and an X-Y drive, for activating the X-Y drive to activate a plurality of light-emitting centers for polymerizing a predetermined thickness of building material on a platform in a bath of liquid photo-activatable building material, and continuing activating the X-Y drive in accordance with a preselected fabrication scheme until the article is fabricated,

the X-Y drive, coupled to the controller, for, in response to signals from the controller, moving the plurality of light-emitting centers in accordance with the predetermined fabrication scheme;

the plurality of light-emitting centers, coupled to be activated by the light-emitting array power and timing counter, to a cooling unit, and to the X-Y drive, for passing over the layer and photo-activating the layer of photo-activatable building material in accordance with a predetermined photo-initiation process to obtain polymerization of the building material, wherein the cooling unit provides for heat removal from an area proximate to the light-emitting centers;

wherein the plurality of light-emitting centers photo-activate each successive layer until the article is fabricated; and

the platform, coupled to the controller, for moving the platform proximate to the plurality of light-emitting centers in accordance with a predetermined scheme to present a predetermined layer of photo-initiable liquid to the plurality of light-emitting centers in accordance with the predetermined photo-initiation process.